

CASCADE: Computational Assessments of Scenarios of Change for the Delta Ecosystem

Executive Summary

Agencies of the CALFED Bay-Delta Authority (CBDA) face tough decisions as they search for strategies to meet their programmatic goals of stabilizing water supplies in California, providing safe drinking water to a growing population, and sustaining diverse populations of native species and their supporting ecosystem functions. The challenge of finding balanced solutions to these goals is daunting because of the enormous complexity of the San Francisco Bay-Delta system and its tributary rivers and their watersheds. The challenge grows as we consider the additional layer of complexity imposed by the certainty that all the key forces that drive dynamics of this ecosystem (climate, hydrology, water management, land use, population, sea level) will change significantly in future decades. This proposal describes a model-based approach for developing a long view of the Bay-Delta-River-Watershed system. The long view will be developed through simulations with linked models to project changes under a range of plausible scenarios of climate change, Delta configurational changes, and land-use/population change. Scenarios were selected to provide robust and plausible future visions motivated by the following kinds of questions: How might global warming alter California's precipitation, streamflow and flood frequency in the 21st century? Will continued rise of sea level or catastrophic levee failure move salt into the Delta and require additional releases of impounded water to meet drinking water standards? How will new storage and conveyance structures alter water flow across the Delta? Will altered streamflow, temperature and transports influence production of juvenile salmon, spawning of Delta smelt, or other processes regulating species of concern? Will alien species exploit new habitats, disrupt foodwebs that sustain native species, or alter the movement of toxic elements into foodwebs? Will system productivity increase or decrease? Will sediment retention in reservoirs limit our capacity to build new habitats or change the sediment supply and geomorphology of San Francisco Bay? How might all these changes interact to constrain CBDA success at meeting its goals? Can we anticipate and adapt management strategies to these system changes before they occur? Our **goals** are to develop and apply a model-based approach of ecological forecasting to project future states of the Delta ecosystem under prescribed scenarios of change, and to communicate the outcomes of those evaluations to resource managers facing the daunting challenge of meeting CBDA goals in a continually changing world.